



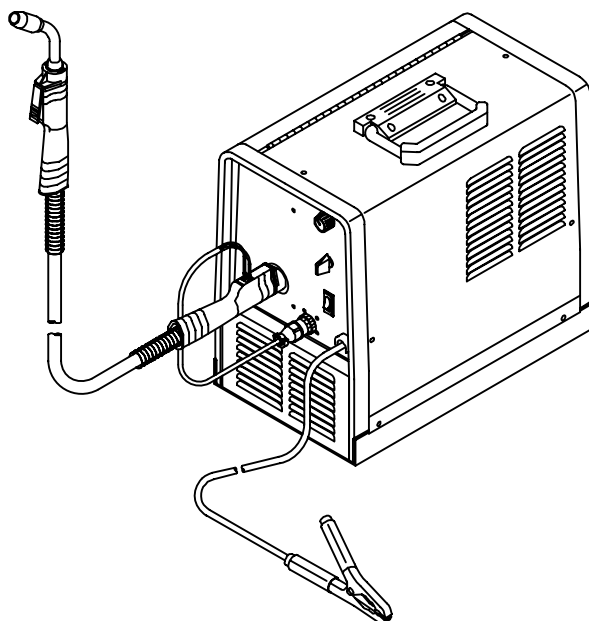
**Miller**®

June 1996

Form: OM-1314

Effective With Serial No. KG171523

# OWNER'S MANUAL



## Millermatic® 155 And M-15 Gun

230 Volt Wire Welder

| Rated Welding Output                  | Amperage Range                | Maximum Open-Circuit Voltage DC | Amperes Input at Rated Load Output 115 V, 60 Hz, Single-Phase | KVA                               | KW       | Weight          | Overall Dimensions  |
|---------------------------------------|-------------------------------|---------------------------------|---|-----------------------------------|----------|-----------------|---|
| 130 A @ 20.5 Volts DC, 30% Duty Cycle | 40 – 170                      | 33                              | 20.5 (0.27)*  | 4.7 (.05)*                        | 4 (.04)* | 80 lb (36.3 kg) | Length: 17 in (432 mm)<br>Width: 10 in (254 mm)<br>Height: 15-1/2 in (394 mm) |
| Wire Type And Dia                     | Solid/ Stainless              | Flux Cored/ Aluminum            | Calculated Wire Speed Range At No Load                        | Max Wire Feed Speed While Welding |          |                 |   |
|                                       | .023 – .035 in (0.6 – 0.9 mm) | .030 – .045 in (0.8 – 1.1 mm)   | 126 – 722 IPM (3.2 – 18.3 m/min)                              | 500 IPM (12.7 m/min)              |          |                 |   |

\* While idling

# MILLER'S TRUE BLUE® LIMITED WARRANTY

Effective February 7, 1996  
(Equipment with a serial number preface of "KD" or newer)

This limited warranty supersedes all previous MILLER warranties and is exclusive with no other guarantees or warranties expressed or implied.

**LIMITED WARRANTY**—Subject to the terms and conditions below, MILLER Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new MILLER equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by MILLER. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, MILLER will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. MILLER must be notified in writing within thirty (30) days of such defect or failure, at which time MILLER will provide instructions on the warranty claim procedures to be followed.

MILLER shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an international distributor.

1. 5 Years Parts — 3 Years Labor
  - Original main power rectifiers
  - Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
  - Transformer/Rectifier Power Sources
  - Plasma Arc Cutting Power Sources
  - Semi-Automatic and Automatic Wire Feeders
  - Inverter Power Supplies
  - Intellitigs
  - Robots
3. 2 Years — Parts and Labor
  - Engine Driven Welding Generators  
(NOTE: Engines are warranted separately by the engine manufacturer.)
  - Air Compressors
4. 1 Year — Parts and Labor
  - Motor Driven Guns
  - Process Controllers
  - IHPS Power Sources
  - Water Coolant Systems
  - HF Units
  - Grids
  - Spot Welders
  - Load Banks
  - SDX Transformers
  - Miller Cyclomatic Equipment
  - Running Gear/Trailers
  - Plasma Cutting Torches (except APT, ZIPCUT & PLAZCUT Models)
  - Tecumseh Engines
  - Deutz Engines (outside North America)
  - Field Options  
(NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
5. 6 Months — Batteries

6. 90 Days — Parts and Labor
  - MIG Guns/TIG Torches
  - APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
  - Remote Controls
  - Accessory Kits
  - Replacement Parts

MILLER'S True Blue® Limited Warranty shall not apply to:

1. Items furnished by MILLER, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
2. Consumable components; such as contact tips, cutting nozzles, contactors and relays or parts that fail due to normal wear.
3. Equipment that has been modified by any party other than MILLER, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at MILLER'S option: (1) repair; or (2) replacement; or, where authorized in writing by MILLER in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized MILLER service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. MILLER'S option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a MILLER authorized service facility as determined by MILLER. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

## RECEIVING-HANDLING

Before unpacking equipment, check carton for any damage that may have occurred during shipment. File any claims for loss or damage with the delivering carrier. Assistance for filing or settling claims may be obtained from distributor and/or equipment manufacturer's Transportation Department.

When requesting information about this equipment, always provide Model Designation and Serial or Style Number.

Use the following spaces to record Model Designation and Serial or Style Number of your unit. The information is located on the rating label or nameplate.



Model \_\_\_\_\_

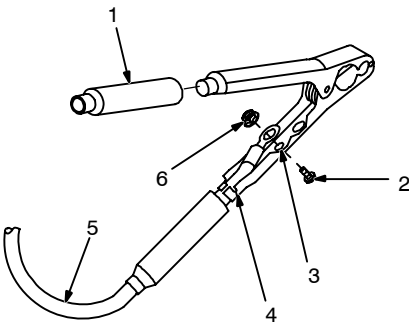
Serial or Style No. \_\_\_\_\_

Date of Purchase \_\_\_\_\_

# SECTION 1 – INSTALLATION

## 1-1. Installing Work Clamp


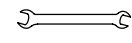


- 1 Insulator
- 2 Bolt
- 3 Smaller Hole
- 4 Work Clamp Tabs

Bend tabs around work cable.

- 5 Work Cable From Unit
- 6 Nut




Tools Needed:

3/8, 7/16 in

Ref. ST-025 190-D

## 1-2. Installing Welding Gun And Setting Gun Polarity For Wire Type

- 1 Gun Opening
- 2 Gun Trigger Receptacle
- 3 Gun Securing Nut
- 4 Drive Assembly
- 5 Gun End

Loosen securing nut. Insert gun end through opening until it bottoms against drive assembly. Tighten nut.

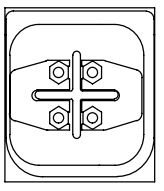
- 6 Gun Trigger Plug

Insert plug into receptacle, and tighten threaded collar.

Close door.

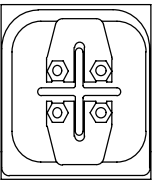
Follow wire manufacturer's recommendation.

**Flux Cored Wires  
(FCAW-Without Gas)**

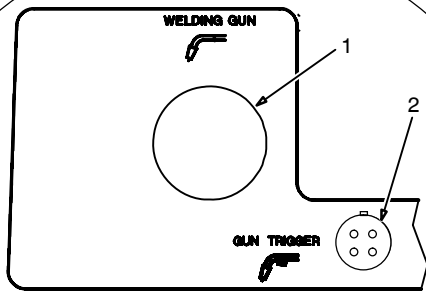


Straight Polarity  
DCEN

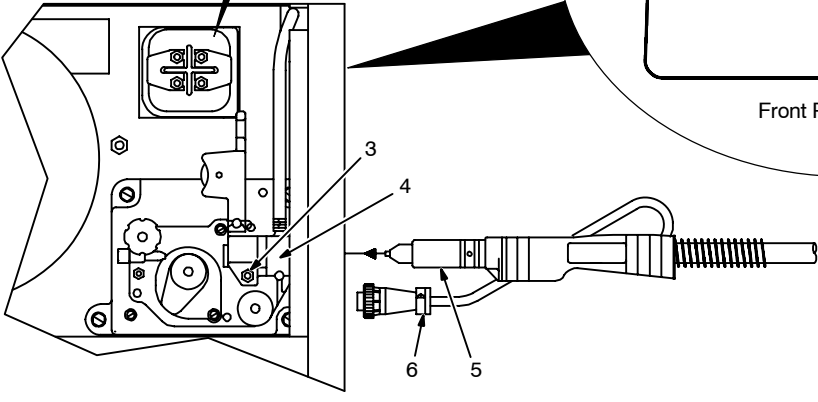
**Solid Steel Or  
Aluminum Wires  
(GMAW-With Gas)**




Reverse Polarity  
DCEP



Front Panel Openings



Tools Needed:



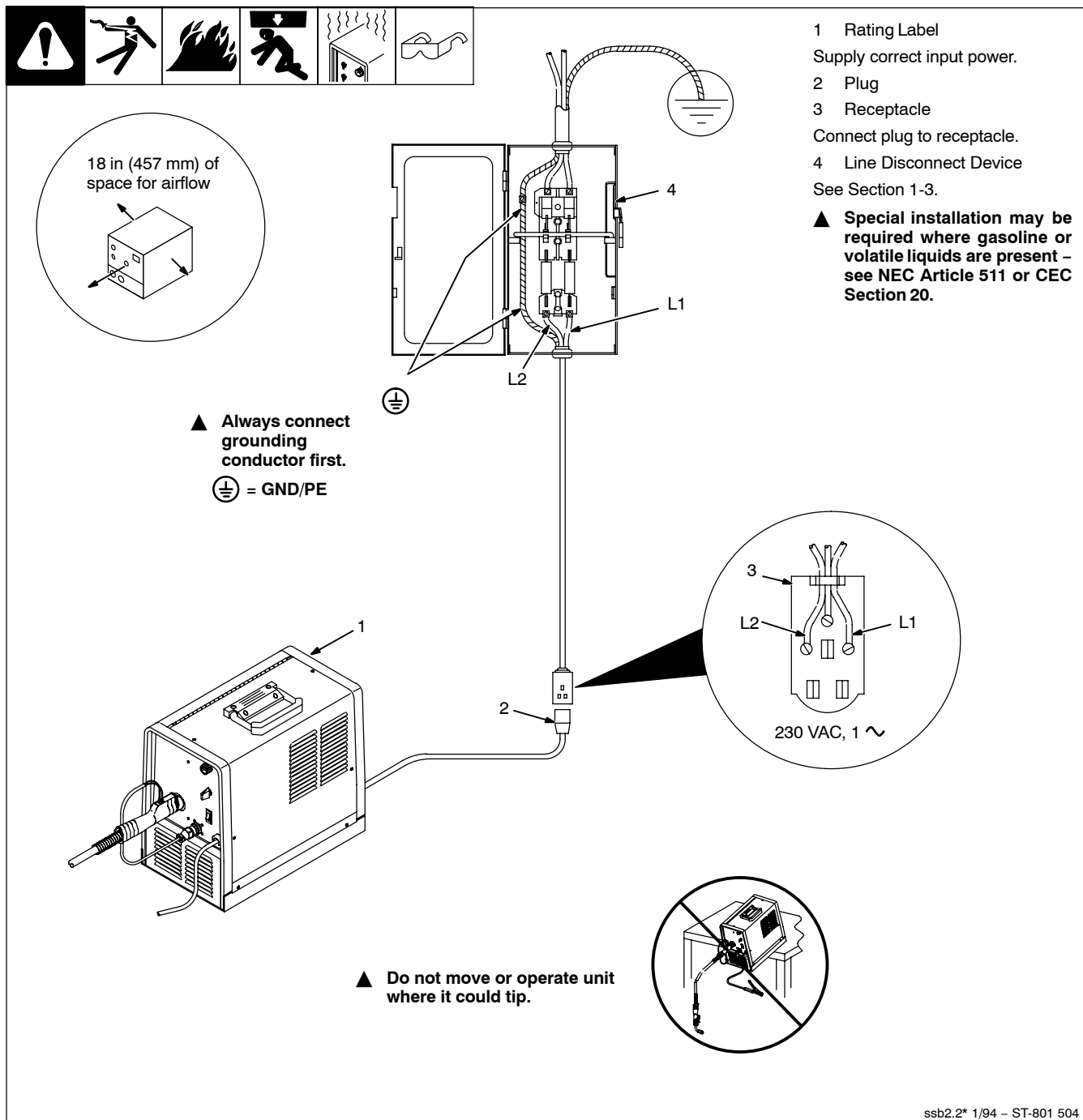
5/16 in

ST-149 328-B / Ref. ST-159 270

### 1-3. Electrical Service Guide

|  |         |
|--|---------|
| Input Voltage  | 230     |
| Input Amperes At Rated Output                                      | 20.5    |
| Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes | 25      |
| Min Input Conductor Size In AWG/Kcmil                              | 14      |
| Max Recommended Input Conductor Length In Feet (Meters)            | 64 (19) |
| Min Grounding Conductor Size In AWG/Kcmil                          | 14      |
| Reference: 1996 National Electrical Code (NEC)                     |         |
| S-0092-J   |         |

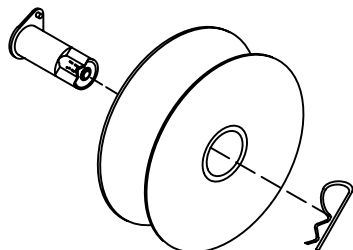
### 1-4. Selecting A Location And Connecting Input Power



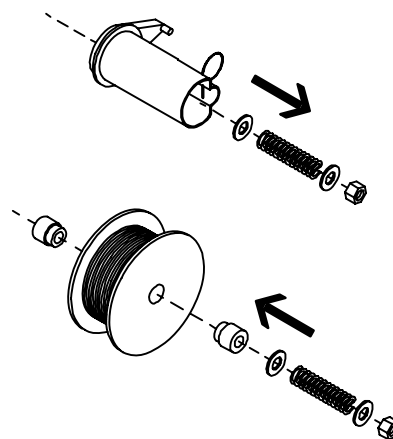
## 1-5. Installing Wire Spool And Adjusting Hub Tension



Standard Wire Spool

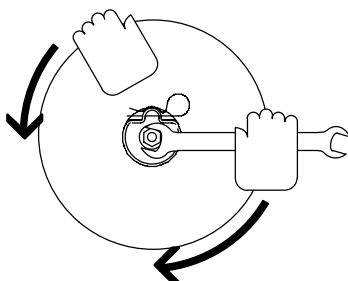
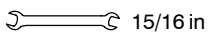


1 Lb Wire Spool



When a slight force is needed to turn spool, tension is set.

Tools Needed:

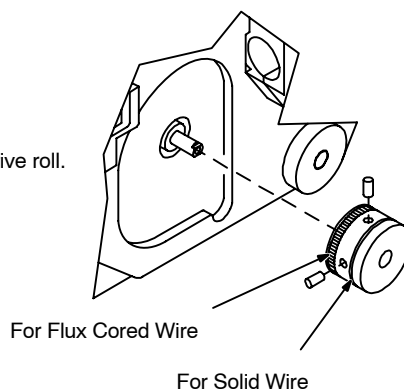


S-0499

## 1-6. Installing Drive Roll And Threading Welding Wire

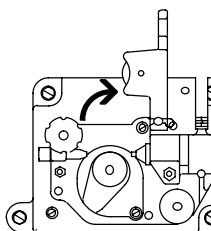


1 Install drive roll.

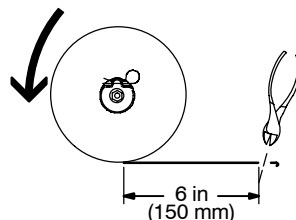


Install drive roll onto shaft with desired groove in, and one set screw facing flat side of shaft. Tighten both set screws.

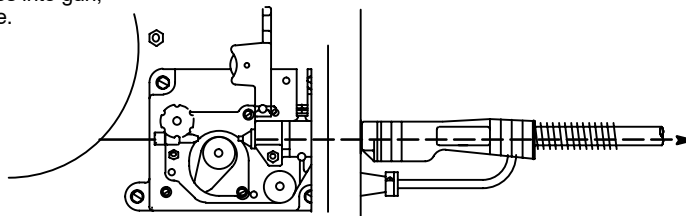
2 Open pressure assembly.



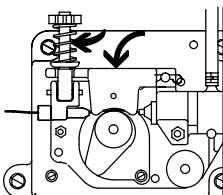
3 Pull and hold wire; cut off end.



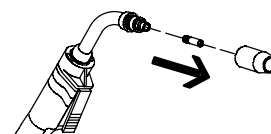
4 Push wire thru guides into gun; continue to hold wire.



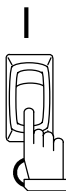
5 Close and tighten pressure assembly, and let go of wire.



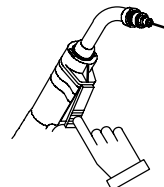
6 Remove gun nozzle and contact tip.



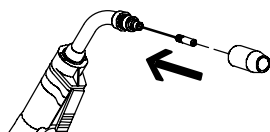
7 Turn power On.



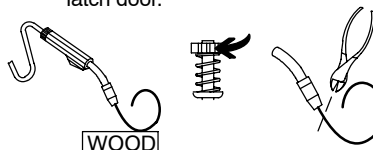
8 Press gun trigger until wire comes out of gun.



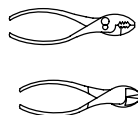
9 Reinstall contact tip and nozzle.



10 Feed wire to check drive roll pressure. Tighten knob enough to prevent slipping. Cut off wire; leave 1/4-1/2 in (6-13 mm). Close and latch door.



Tools Needed:



## SECTION 2 – OPERATION

### 2-1. Controls



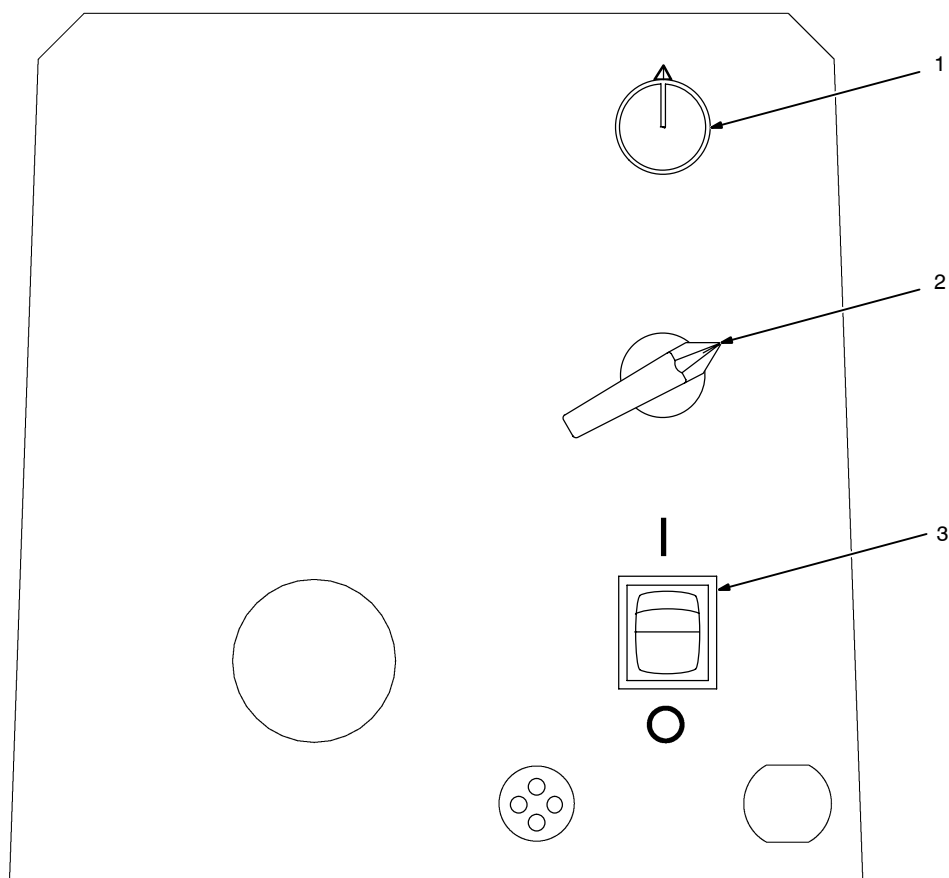
#### 1 Wire Speed Control

Use control to select a wire feed speed. As Voltage switch setting increases, wire speed range also increases.

#### 2 Voltage Switch

The higher the selected number, the thicker the material that can be welded. Do not switch while welding.

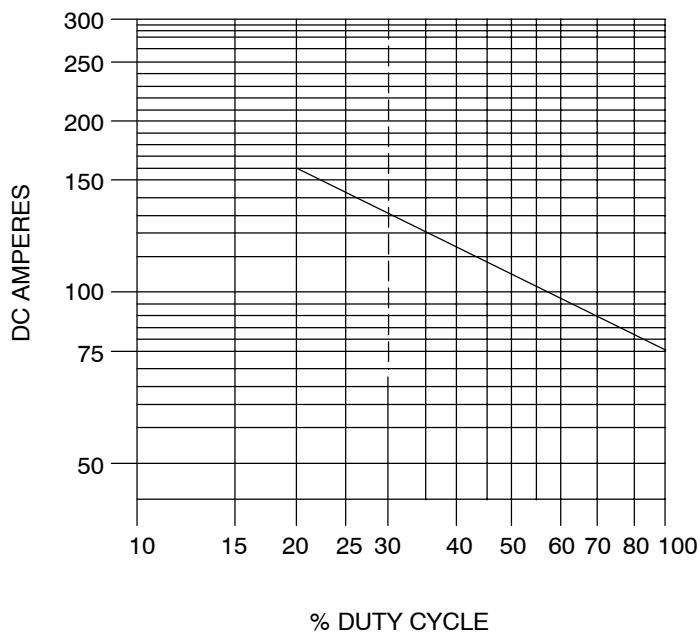
#### 3 Power Switch



## NOTES



## 2-2. Duty Cycle And Overheating

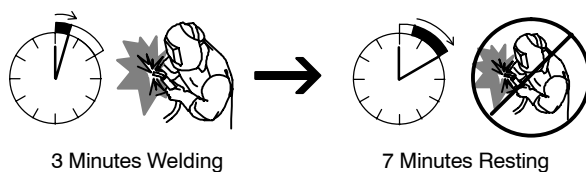


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

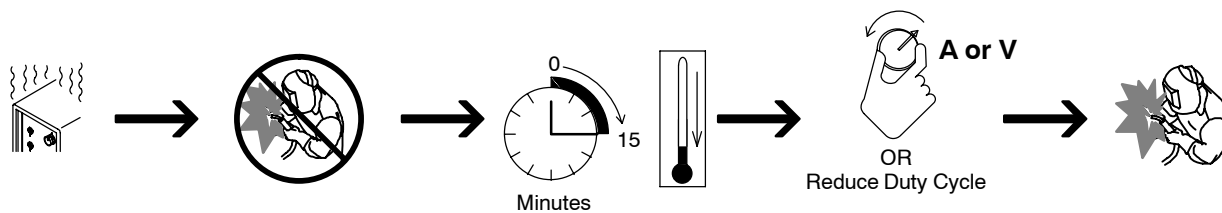
If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

**▲ Exceeding duty cycle can damage unit or gun and void warranty.**

30% Duty Cycle At 130 Amperes



### Overheating



# SECTION 3 – MAINTENANCE & TROUBLESHOOTING

## 3-1. Maintenance

|                 |  |   |  |  |  |
|-----------------|--|---|--|--|--|
|                 |  | <b>Disconnect power before maintaining.</b> |  | <b>Maintain more often during severe conditions.</b> |  |
| <b>3 Months</b> |  |   |  |  |  |
|                 |  |   |  |  |  |
|                 |  |   |  |  |  |
|                 |  |   |  |  |  |
| <b>6 Months</b> |  |   |  |  |  |
|                 |  |   |  |  |  |

stat\_maint – 2/96

## 3-2. Fuse F1

|   |  |  |  |  |  |
|---|--|--|--|--|--|
|   |  |  |  |  |  |
|   |  |  |  |  |  |
| <b>Turn Off unit, disconnect input power. Unlatch door and remove wrapper.</b>                      |  |  |  |  |  |
| 1 Circuit Board PC1<br>2 Fuse F1 (See Parts List For Rating)  |  |  |  |  |  |
| If F1 opens, wire drive motor shuts down. Replace F1 if open.<br>Reinstall wrapper, and latch door. |  |  |  |  |  |
| <b>Tools Needed:</b><br>3/8 in<br>  |  |  |  |  |  |

Ref. ST-801 552

## 3-3. Short Circuit Shutdown

If contact tip is shorted and sticks to workpiece, the unit shuts down, but fan runs. To resume operation, release gun trigger, turn Off unit, and remove contact tip from workpiece. Check contact tip and replace if damaged. Turn On unit to continue operation.

### 3-4. Replacing Gun Contact Tip



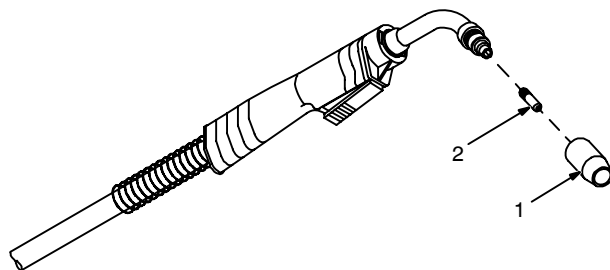
▲ Turn Off power before replacing contact tip.

1 Nozzle

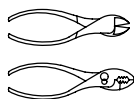
2 Contact Tip

Cut off welding wire at contact tip. Remove nozzle.

Remove contact tip and install new contact tip. Reinstall nozzle.



Tools Needed:

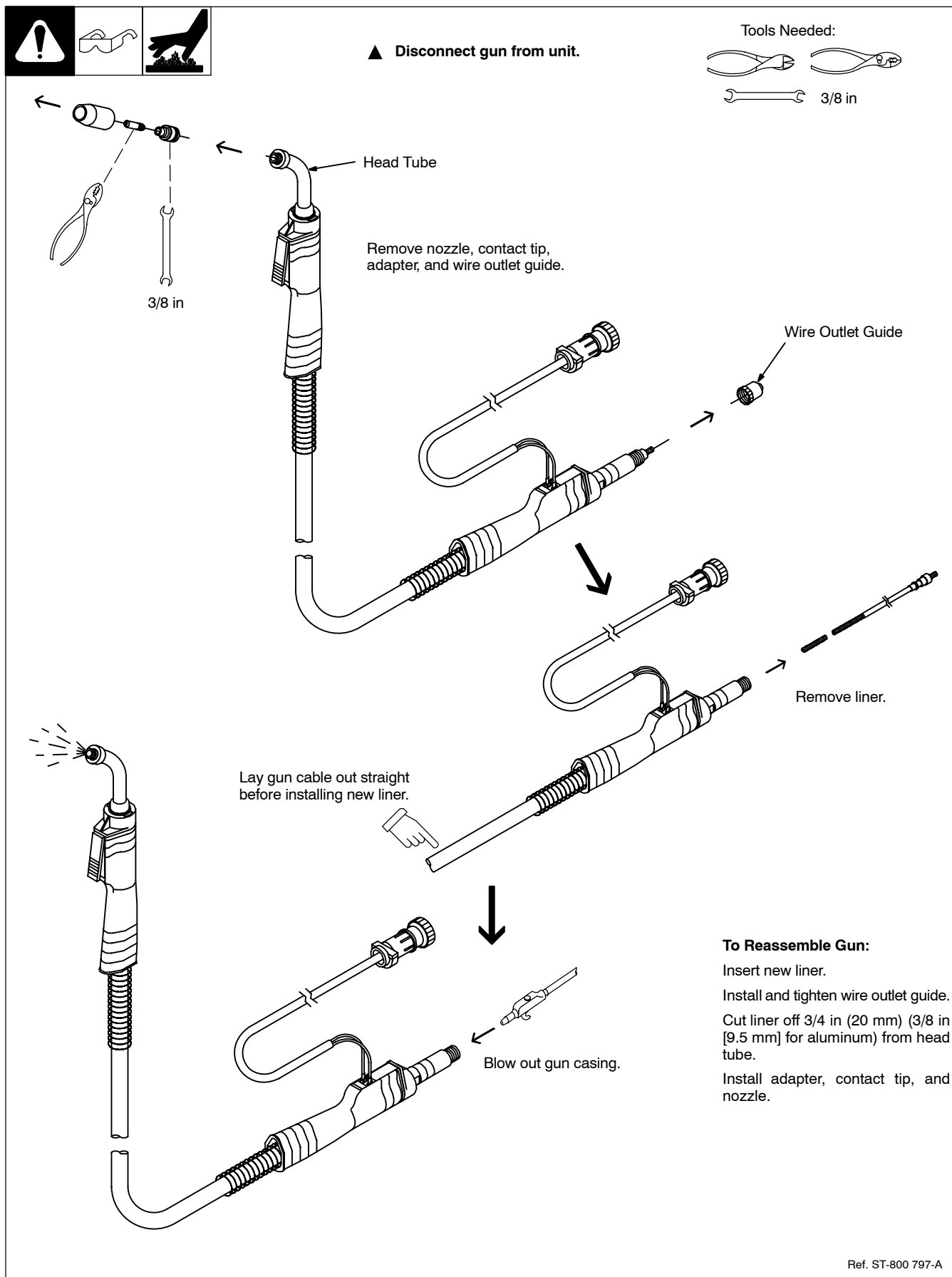


ST-149 326-B

### 3-5. Unicable Repair

To repair or replace uncable, order Uncable Clamp Kit, part number 172 017. Kit includes all required instructions, clamps, inner support tube, compression clip, switch leads, and connectors.

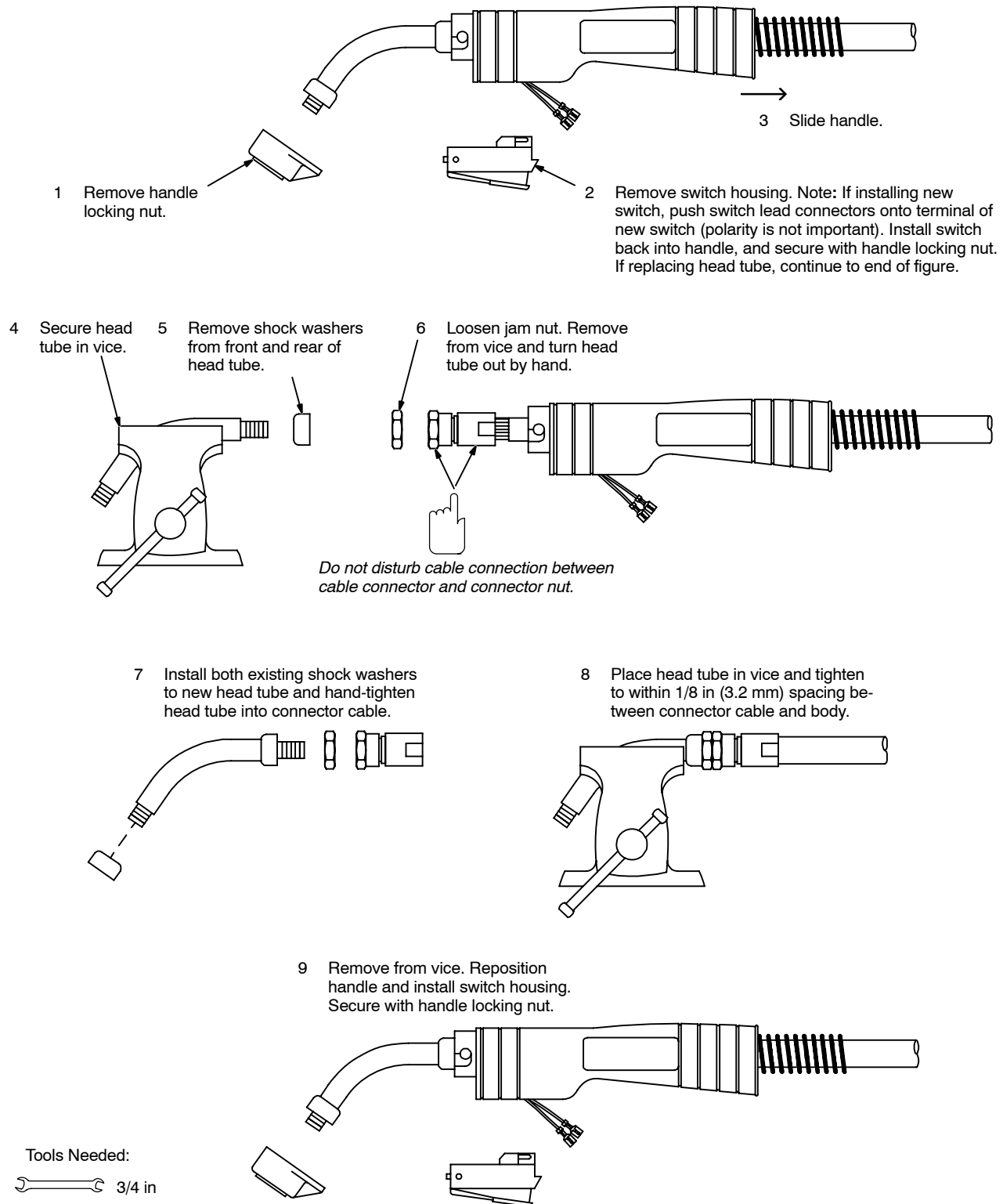
### 3-6. Cleaning Or Replacing Gun Liner



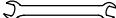
### 3-7. Replacing Switch And/Or Head Tube



▲ Disconnect gun from unit.



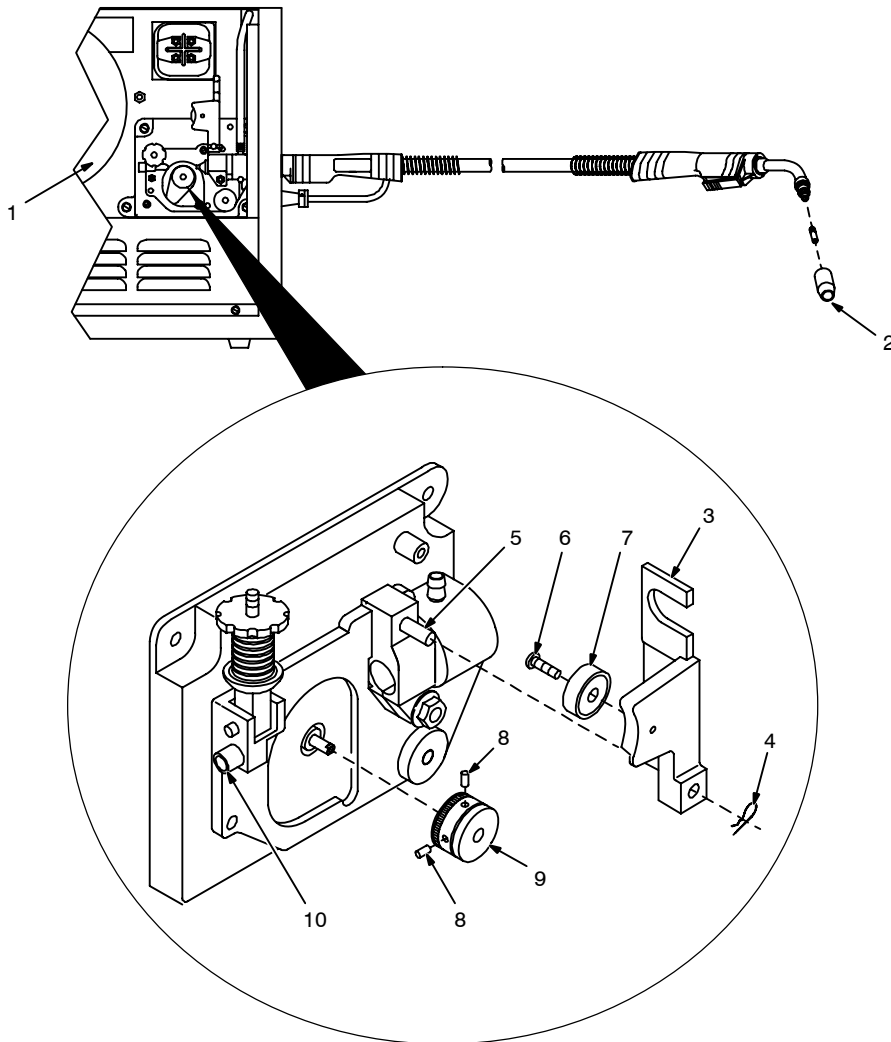
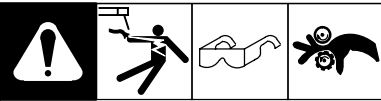
Tools Needed:

 3/4 in



Ref. ST-800 795-A

### 3-8. Cleaning Or Repairing Drive Assembly



▲ **Turn Off power before cleaning or repairing drive assembly.**

1 Wire Spool

2 Nozzle

Cut welding wire off at nozzle. Retract wire onto spool and secure.

3 Pressure Roll Arm

4 Cotter Pin

5 Pin

6 Screw

7 Bearing

Remove bearing. Install new bearing and secure with screw. Reinstall arm onto pin and secure with cotter pin.

8 Setscrew

9 Drive Roll

Remove drive roll.

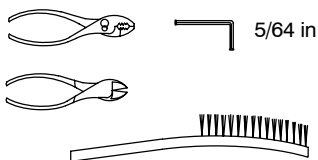
Push drive roll onto shaft with desired groove in. Turn drive roll so one setscrew faces flat side of shaft, and tighten both setscrews.

10 Wire Inlet Guide

Remove guide by pressing on barbed area or cutting off one end near housing and pulling it out of hole. Push new guide into hole from rear until it snaps in place.







Close door.

Tools Needed:



Ref. ST-150 093-A / ST-149 266-B

### 3-9. Troubleshooting

|       |  |
|---|--|
| Welding Trouble   | Remedy   |
| No weld output; wire does not feed.   | Secure power cord plug in receptacle (see Section 1-4).  |
|   | Check and replace power switch if necessary.   |
|   | Check fuse F1, and replace if necessary (see Section 3-2).   |
|   | Replace building line fuse or reset circuit breaker if open (see Section 1-4).   |
|   | Secure gun trigger plug in receptacle or repair leads, or replace trigger switch (see Section 1-2 and/or 3-7).             |
|   | Thermostat TP1 open (overheating). Allow fan to run; the thermostat will close when the unit has cooled (see Section 2-2). |
| No weld output; wire feeds.   | Connect work clamp to get good metal to metal contact.   |
|   | Replace contact tip (see Section 3-4).   |
| Low weld output.  | Connect unit to proper input voltage or check for low line voltage (see Section 1-4).                                      |
| Low, high, or erratic wire speed.   | Readjust front panel settings (see Section 2-1).   |
|   | Change to correct groove in drive roll (see Section 1-6).  |
|   | Readjust drive roll pressure (see Section 1-6).  |
|   | Replace inlet guide, contact tip, and/or liner if necessary (see Sections 3-8, 3-4 and/or 3-6).                            |
| Wire Drive/Gun Trouble  | Remedy   |
| Electrode wire feeding stops during welding.  | Straighten gun cable and/or replace damaged parts (see Section 3-6).   |
|   | Adjust drive roll pressure (see Section 1-6).  |
|   | Readjust hub tension (see Section 1-5).  |
|   | Replace contact tip if blocked (see Section 3-4).  |
|   | Clean or replace wire inlet guide or liner if dirty or plugged (see Section 3-8, and Section 3-6).                         |
|   | Replace drive roll if worn or slipping (see Section 1-6).  |
|   | Secure gun trigger plug in receptacle or repair leads, or replace trigger switch (see Section 1-2 and/or 3-7).             |
|   | Check and clear any restrictions at drive assembly and liner (see Section 3-8, and Section 3-6).                           |
|   | Have nearest Factory Authorized Service Agent check drive motor.   |

# SECTION 4 – SAFETY PRECAUTIONS FOR ARC WELDING

OM-1314 – 6/96

safety\_som1 4/95

## 4-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ Marks a special safety message.

☞ Means NOTE; not safety related.



This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

## 4-2. Arc Welding Hazards



### WARNING

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 4-4. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this unit.

During operation, keep everybody, especially children, away.



### ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal

in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.

7. When making input connections, attach proper grounding conductor first – double-check connections.
8. Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
9. Turn off all equipment when not in use.
10. Do not use worn, damaged, undersized, or poorly spliced cables.
11. Do not drape cables over your body.
12. If earth grounding of the workpiece is required, ground it directly with a separate cable – do not use work clamp or work cable.
13. Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
14. Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
15. Wear a safety harness if working above floor level.
16. Keep all panels and covers securely in place.
17. Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.



### ARC RAYS can burn eyes and skin; NOISE can damage hearing; FLYING SLAG OR SPARKS can injure eyes.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Noise from some processes can damage hearing. Chipping, grinding, and welds cooling throw off pieces of metal or slag.

#### NOISE

1. Use approved ear plugs or ear muffs if noise level is high.

### ARC RAYS

2. Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
3. Wear approved safety glasses with side shields.
4. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
5. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.



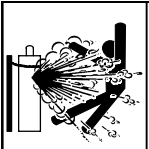
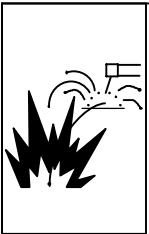
### FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.




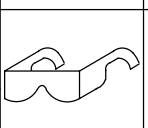

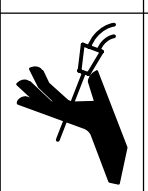

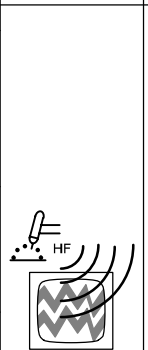
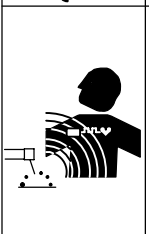
1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, cleaners, and degreasers.

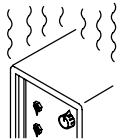

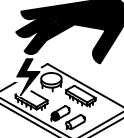

5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



|   |  |
|---|--|
|   | <p><b>CYLINDERS can explode if damaged.</b></p> <p>Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.</p> <ol style="list-style-type: none"> <li>1. Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.</li> <li>2. Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.</li> <li>3. Keep cylinders away from any welding or other electrical circuits.</li> <li>4. Never drape a welding torch over a gas cylinder.</li> <li>5. Never allow a welding electrode to touch any cylinder.</li> <li>6. Never weld on a pressurized cylinder – explosion will result.</li> <li>7. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.</li> <li>8. Turn face away from valve outlet when opening cylinder valve.</li> <li>9. Keep protective cap in place over valve except when cylinder is in use or connected for use.</li> <li>10. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.</li> </ol>   |
|  | <p><b>WELDING can cause fire or explosion.</b></p> <p>Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.</p> <ol style="list-style-type: none"> <li>1. Protect yourself and others from flying sparks and hot metal.</li> <li>2. Do not weld where flying sparks can strike flammable material.</li> <li>3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.</li> <li>4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.</li> <li>5. Watch for fire, and keep a fire extinguisher nearby.</li> <li>6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.</li> <li>7. Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).</li> <li>8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.</li> <li>9. Do not use welder to thaw frozen pipes.</li> <li>10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.</li> <li>11. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.</li> <li>12. Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.</li> </ol> |

#### 4-3. Additional Installation, Operation, And Maintenance Hazards

|   |   |   |  |
|---|---|---|--|
|  | <p><b>FIRE OR EXPLOSION can result from placing unit on, over, or near combustible surfaces.</b></p> <ol style="list-style-type: none"> <li>1. Do not locate unit on, over, or near combustible surfaces.</li> <li>2. Do not install unit near flammables.</li> </ol>   |  | <p><b>MOVING PARTS can cause injury.</b></p> <ol style="list-style-type: none"> <li>1. Keep away from moving parts.</li> <li>2. Keep away from pinch points such as drive rolls.</li> </ol>  |
|  | <p><b>FALLING EQUIPMENT can cause serious personal injury and equipment damage.</b></p> <ol style="list-style-type: none"> <li>1. Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.</li> <li>2. Use equipment of adequate capacity to lift unit.</li> <li>3. If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.</li> </ol> |  | <p><b>FLYING PIECES OF METAL or DIRT can injure eyes.</b></p> <ol style="list-style-type: none"> <li>1. Wear safety glasses with side shields or face shield.</li> </ol>   |
|  | <p><b>HOT PARTS can cause severe burns.</b></p> <ol style="list-style-type: none"> <li>1. Do not touch hot parts bare handed.</li> <li>2. Allow cooling period before working on gun or torch.</li> </ol>   |  | <p><b>WELDING WIRE can cause puncture wounds.</b></p> <ol style="list-style-type: none"> <li>1. Do not press gun trigger until instructed to do so.</li> <li>2. Do not point gun toward any part of the body, other people, or any metal when threading welding wire.</li> </ol>   |
|  | <p><b>MOVING PARTS can cause injury.</b></p> <ol style="list-style-type: none"> <li>1. Keep away from moving parts such as fans.</li> <li>2. Keep all doors, panels, covers, and guards closed and securely in place.</li> </ol>  |  | <p><b>HIGH-FREQUENCY RADIATION can interfere with radio navigation, safety services, computers, and communications equipment.</b></p> <ol style="list-style-type: none"> <li>1. Have only qualified persons familiar with electronic equipment perform this installation.</li> <li>2. The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.</li> <li>3. If notified by the FCC about interference, stop using the equipment at once.</li> <li>4. Have the installation regularly checked and maintained.</li> <li>5. Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.</li> </ol> |
|  | <p><b>MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.</b></p> <ol style="list-style-type: none"> <li>1. Pacemaker wearers keep away.</li> <li>2. Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.</li> </ol>  |   |  |

|   |  |   |   |
|---|--|---|---|
|  | <p><b>OVERUSE can cause OVERHEATED EQUIPMENT.</b></p> <ol style="list-style-type: none"> <li>1. Allow cooling period.</li> <li>2. Reduce current or reduce duty cycle before starting to weld again.</li> <li>3. Follow rated duty cycle.</li> </ol>                         |  | <p><b>SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.</b></p> <ol style="list-style-type: none"> <li>1. Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.</li> </ol> |
|  | <p><b>STATIC ELECTRICITY can damage parts on circuit boards.</b></p> <ol style="list-style-type: none"> <li>1. Put on grounded wrist strap BEFORE handling boards or parts.</li> <li>2. Use proper static-proof bags and boxes to store, move, or ship PC boards.</li> </ol> |  | <p><b>BUILDUP OF SHIELDING GAS can harm health or kill.</b></p> <ol style="list-style-type: none"> <li>1. Shut off shielding gas supply when not in use.</li> </ol>   |

#### 4-4. Principal Safety Standards

*Safety in Welding and Cutting*, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

*Safety and Health Standards*, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

*Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances*, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

*National Electrical Code*, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

*Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

*Code for Safety in Welding and Cutting*, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

*Safe Practices For Occupation And Educational Eye And Face Protection*, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

*Cutting And Welding Processes*, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

#### 4-5. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, *Biological Effects of Power Frequency Electric & Magnetic Fields – Background Paper*, OTA-BP-E-53 (Washington, DC: U.S. Government Printing Office, May 1989): “. . . there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields can interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks.”

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around the body.
4. Keep welding power source and cables as far away as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

##### About Pacemakers:

The above procedures are also recommended for pacemaker wearers. Consult your doctor for complete information.

# SECTION 5 – ELECTRICAL DIAGRAM

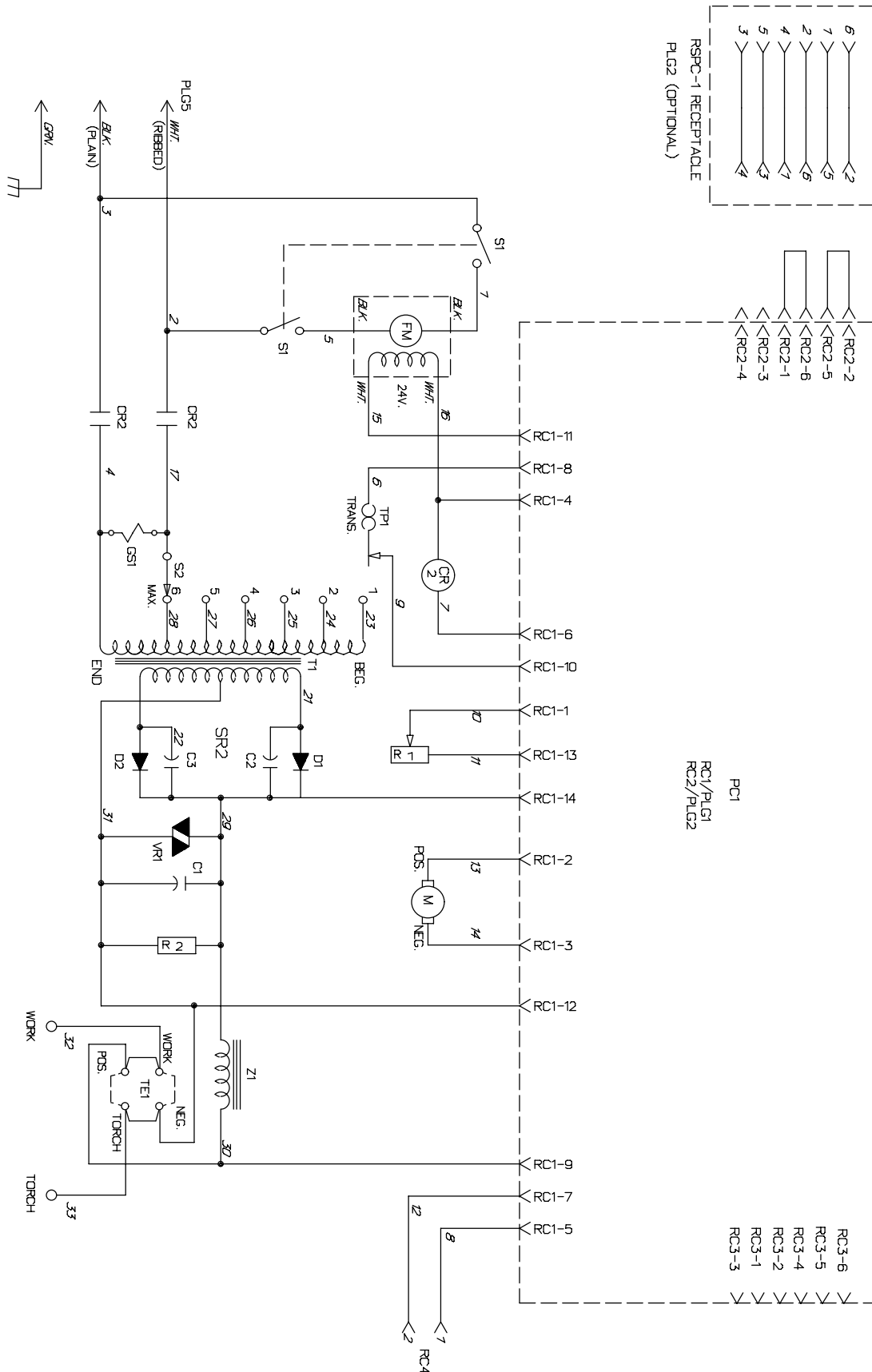
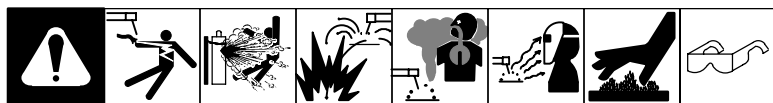


Figure 5-1. Circuit Diagram


# SECTION 6 – WELDING METHODS & TROUBLESHOOTING

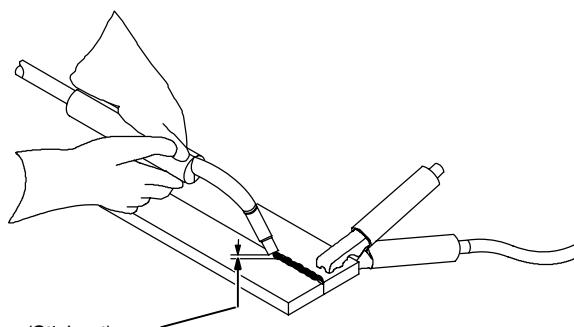
mod4.1\* 9/92

## A. Welding Methods



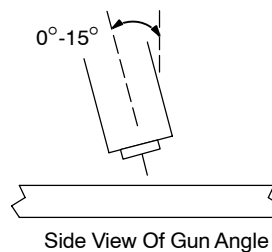
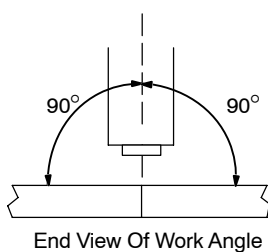
### 6-1. Holding And Positioning Welding Gun

 Cradle gun and rest hand on workpiece. Place tip of wire on seam before lowering helmet and pressing trigger. Welding wire is not energized until gun trigger is pressed.

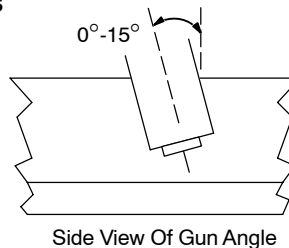
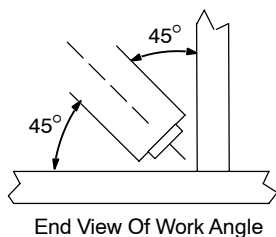


Wire Extension (Stickout)  
1/4 – 1/2 in (6 – 13 mm)

#### GROOVE WELDS



#### FILLET WELDS

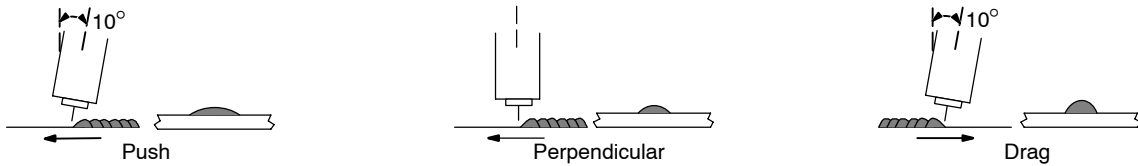


S-0421-A

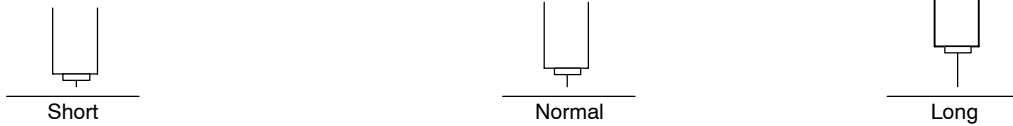
## 6-2. Conditions That Affect Weld Bead Shape

☞ Weld bead shape depends on gun angle, direction of travel, wire extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.

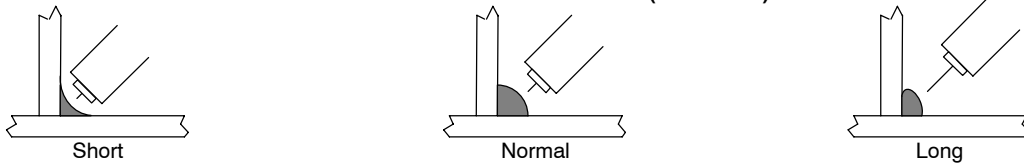
### GUN ANGLES AND WELD BEAD PROFILES



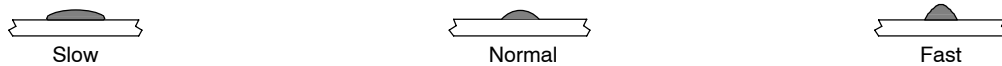
### WIRE EXTENSIONS (STICKOUT)



### FILLET WELD WIRE EXTENSIONS (STICKOUT)

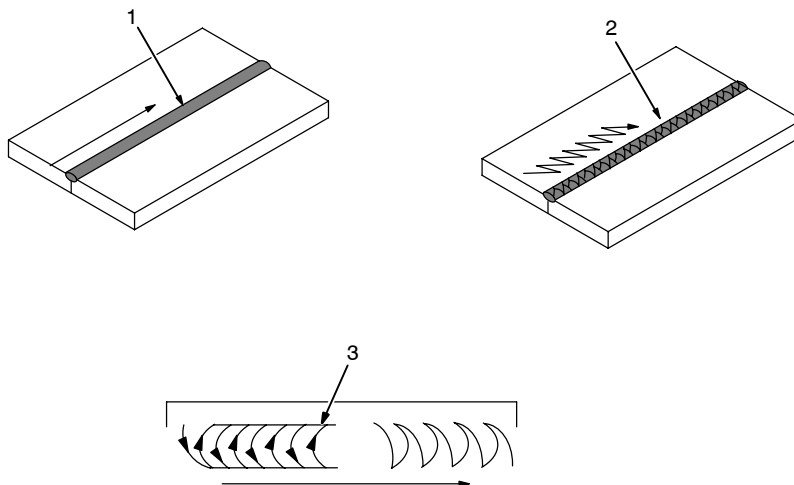


### GUN TRAVEL SPEED



S-0634

## 6-3. Gun Movement During Welding



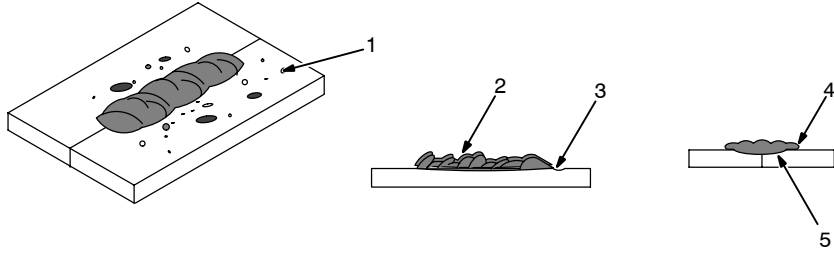
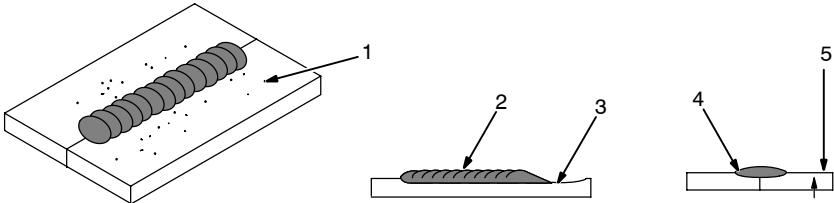
A single stringer bead is satisfactory for most narrow groove weld joints. For wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.

- 1 Stringer Bead – Steady Movement Along Seam
- 2 Weave Bead – Side To Side Movement Along Seam
- 3 Weave Patterns

Use weave patterns to cover a wide area in one pass of the electrode. Do not let weave width exceed 2-1/2 times diameter of electrode.

S-0054-A

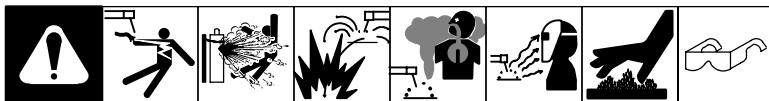
## 6-4. Weld Bead Characteristics

| Poor Weld Bead  | Good Weld Bead  |
|---|---|
|   |    |
| <ol style="list-style-type: none"> <li>1 Large Spatter Deposits</li> <li>2 Rough, Uneven Bead</li> <li>3 Slight Crater During Welding</li> <li>4 Bad Overlap</li> <li>5 Poor Penetration</li> </ol> | <ol style="list-style-type: none"> <li>1 Fine Spatter</li> <li>2 Uniform Bead</li> <li>3 Moderate Crater During Welding</li> <li>4 No Overlap</li> <li>5 Good Penetration Into Base Metal</li> </ol> <p>Weld a new bead or layer for each 1/8 in (3.2 mm) thickness in metals being welded.</p> |

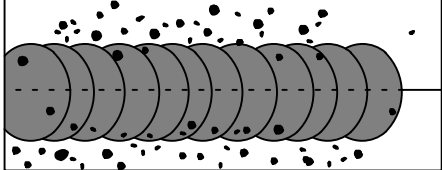
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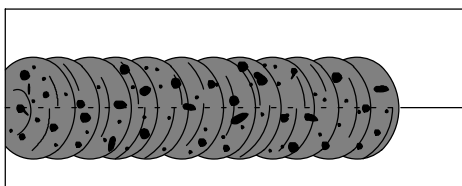
## B. Welding Troubleshooting



**Table 6-1. Excessive Spatter**

|  |   | Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead. |
|---|---|--|
|   |   | S-0636   |
| Possible Causes   | Corrective Actions  |  |
| Wire feed speed too high.   | Select lower wire feed speed.   |  |
| Voltage too high.   | Select lower voltage range.   |  |
| Wire extension (stickout) too long.   | Use shorter wire extension (stickout).  |  |
| Workpiece dirty.  | Remove oil, moisture, rust, and paint, etc. from work surface before welding.                 |  |
| Insufficient shielding gas at welding arc.  | Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc. |  |
| Dirty welding wire.   | Use clean, dry welding wire.<br>Eliminate oil or lubricant on welding wire.                   |  |

**Table 6-2. Porosity**

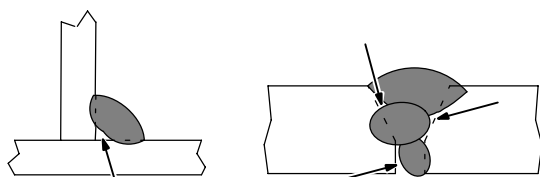


Porosity – small cavities or holes resulting from gas pockets in weld metal.

S-0635

| Possible Causes                             | Corrective Actions   |
|---|--|
| Inadequate shielding gas coverage.          | Check for proper gas flow rate.<br>Remove spatter from gun nozzle.<br>Check gas hoses for leaks.<br>Eliminate drafts near welding arc.<br>Place nozzle 1/4 to 1/2 in (6-13 mm) from workpiece.<br>Hold gun near bead at end of weld until molten metal solidifies. |
| Wrong gas.                                  | Use welding grade shielding gas; change to different gas.  |
| Dirty welding wire.                         | Use clean, dry welding wire.<br>Eliminate oil or lubricant on welding wire.  |
| Workpiece dirty.                            | Remove oil, moisture, rust, and paint, etc. from work surface before welding.<br>Use a more highly deoxidizing welding wire (contact supplier).  |
| Welding wire extends too far out of nozzle. | Be sure welding wire does not extend more than 1/2 in (13 mm) beyond nozzle.   |

**Table 6-3. Incomplete Fusion**

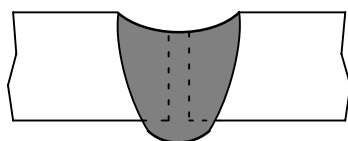


Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceding weld bead.

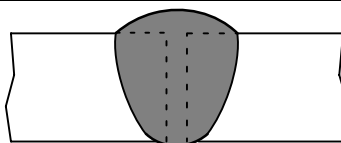
S-0637

| Possible Causes             | Corrective Actions   |
|-----------------------------|--|
| Workpiece dirty.            | Remove oil, moisture, rust, and paint, etc. from work surface before welding.  |
| Insufficient heat input.    | Select higher voltage range and/or adjust wire feed speed.   |
| Improper welding technique. | Place stringer bead in proper location(s) at joint during welding.<br>Adjust the work angle or widen groove to access bottom during welding.<br>Momentarily hold arc on groove side walls when using weaving technique.<br>Keep arc on leading edge of weld puddle.<br>Use correct gun angle of 0 to 15 degrees. |

**Table 6-4. Excessive Penetration**



Excessive Penetration

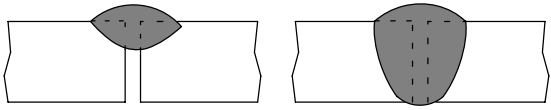


Good Penetration

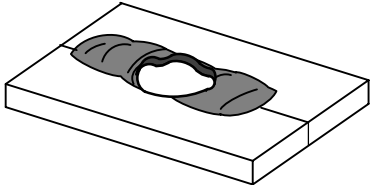
Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

| Possible Causes       | Corrective Actions  |
|-----------------------|---|
| Excessive heat input. | Select lower voltage range and reduce wire feed speed.<br>Increase and/or maintain steady travel speed. |

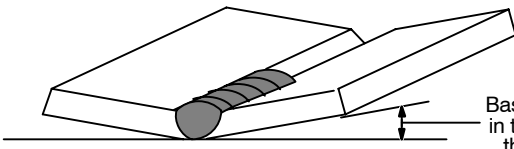
**Table 6-5. Lack Of Penetration**

|  <p>Lack of Penetration      Good Penetration</p> <p style="text-align: right;">S-0638</p> |  | Lack Of Penetration – shallow fusion between weld metal and base metal.  |  |
|---|--|--|--|
| Possible Causes   |  | Corrective Actions   |  |
| Improper joint preparation.   |  | Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.  |  |
| Improper weld technique.  |  | Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration.<br>Keep arc on leading edge of weld puddle.<br>Be sure welding wire does not extend more than 1/2 in (13 mm) beyond nozzle. |  |
| Insufficient heat input.  |  | Select higher wire feed speed and/or select higher voltage range.<br>Reduce travel speed.  |  |

**Table 6-6. Burn-Through**

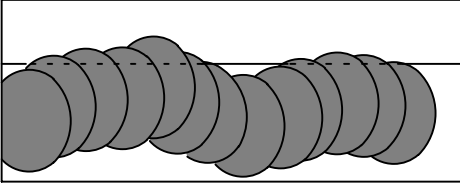
|  |  | Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains. |  |
|---|--|--|--|
| Possible Causes   |  | Corrective Actions   |  |
| Excessive heat input.   |  | Select lower voltage range and reduce wire feed speed.<br>Increase and/or maintain steady travel speed.    |  |

**Table 6-7. Distortion**

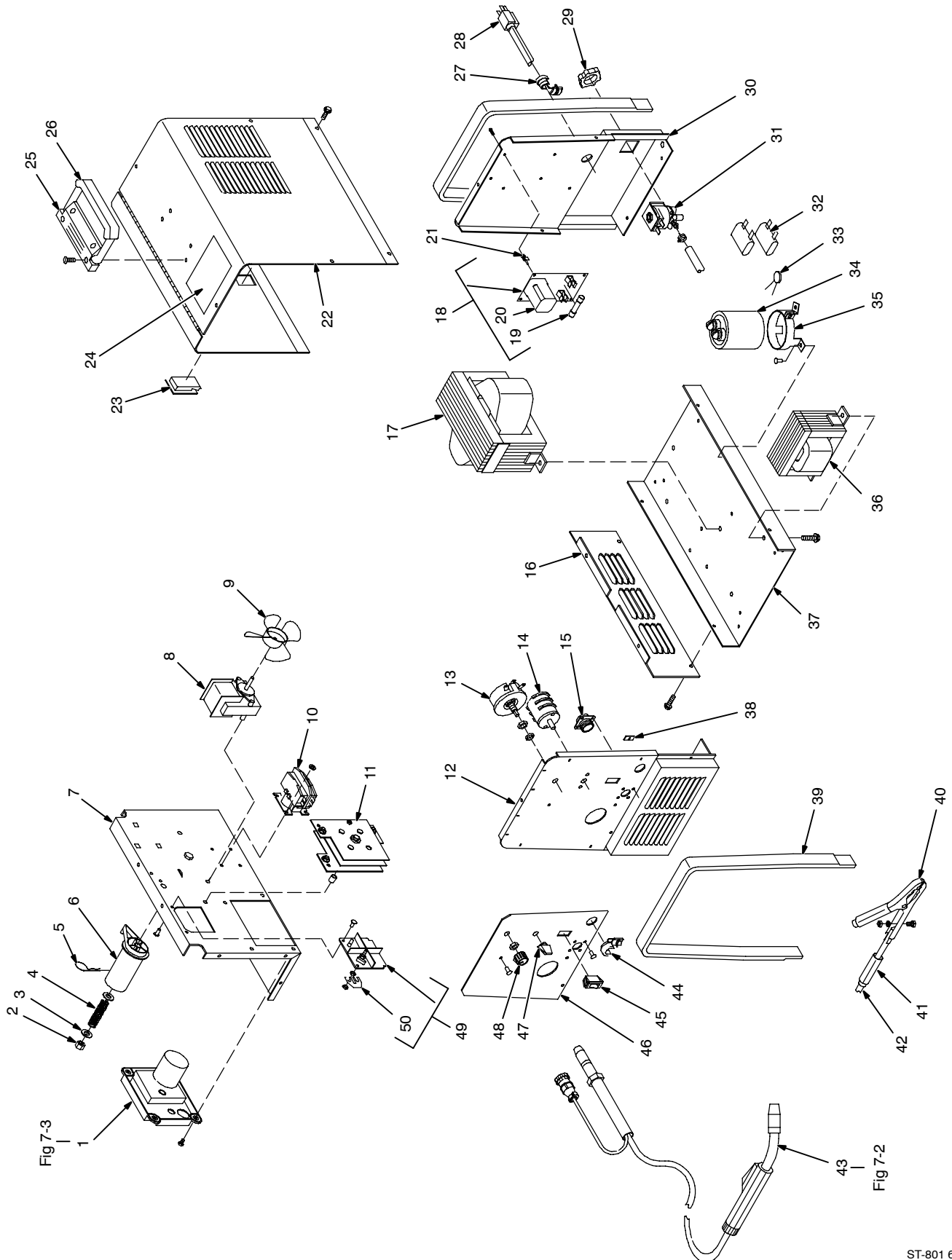
|  <p>Base metal moves in the direction of the weld bead.</p> |  | Distortion – contraction of weld metal during welding that forces base metal to move.  |  |
|--|--|--|--|
| Possible Causes  |  | Corrective Actions   |  |
| Excessive heat input.  |  | Use restraint (clamp) to hold base metal in position.<br>Make tack welds along joint before starting welding operation.<br>Select lower voltage range and reduce wire feed speed.<br>Increase travel speed.<br>Weld in small segments and allow cooling between welds. |  |



**Table 6-8. Waviness Of Bead**

| <div>A diagram showing a series of overlapping circles representing weld ripples. A dashed horizontal line runs through the center of the circles, and a solid horizontal line runs below it. The circles are not perfectly aligned with these lines, illustrating waviness.</div> <div>Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.</div> |  |
|--|--|
| Possible Causes  | Corrective Actions   |
| Welding wire extends too far out of nozzle.  | Be sure welding wire does not extend more than 1/2 in (13 mm) beyond nozzle. |
| Unsteady hand.   | Support hand on solid surface or use two hands. Practice technique.          |

# SECTION 7 – PARTS LIST

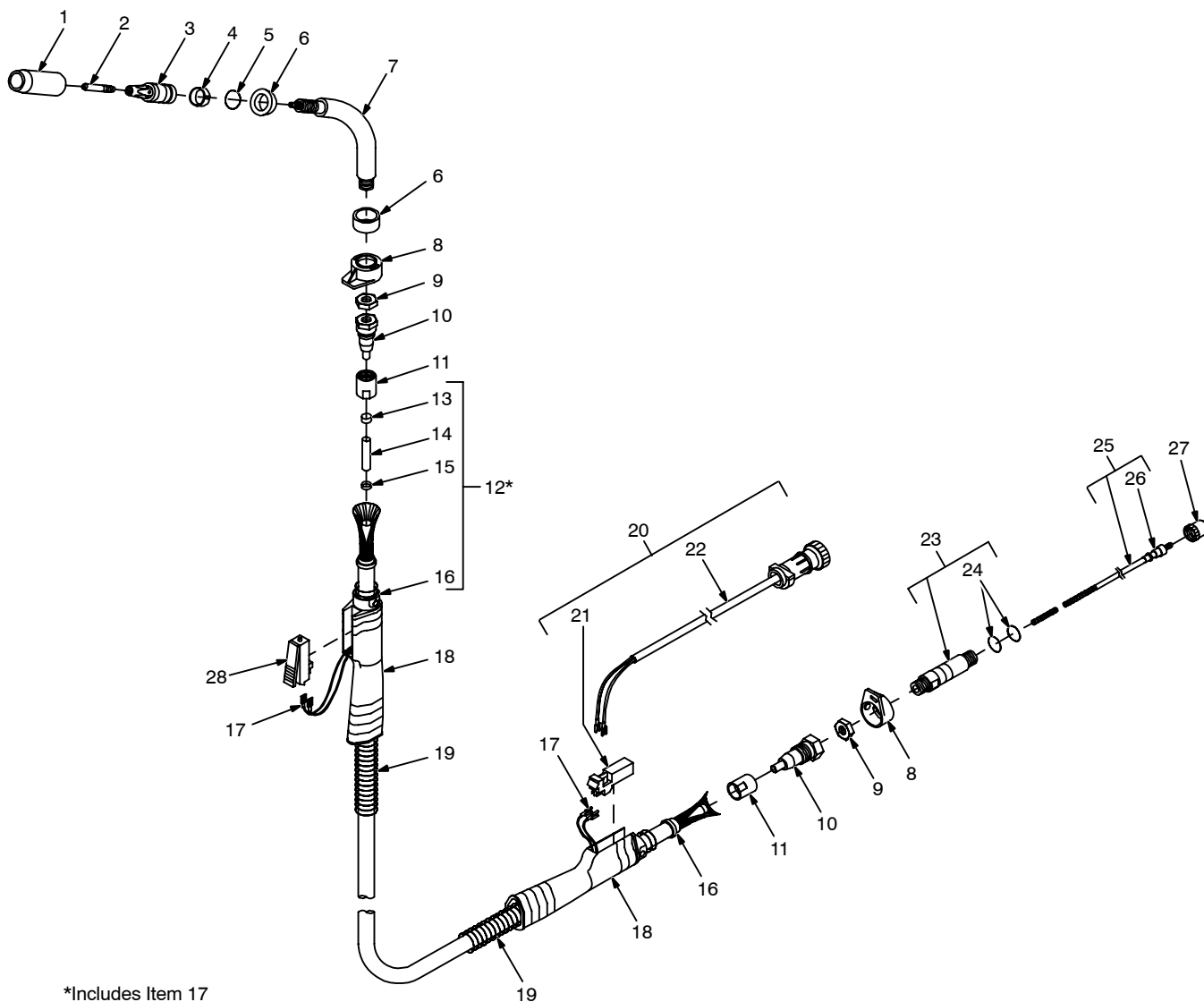


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Figure 7-1. Main Assembly

| Item No.                         | Dia. Mkgs. | Part No. | Description                                   | Quantity |
|----------------------------------|------------|----------|---|----------|
| <b>Figure 7-1. Main Assembly</b> |            |          |   |          |
| 1                                |            | 131 315  | DRIVE ASSEMBLY, wire (Fig 7-3)                | 1        |
| 2                                |            | 010 909  | NUT, 375-16                                   | 1        |
| 3                                |            | 010 910  | WASHER, flat .406 ID x 0.81 OD                | 2        |
| 4                                |            | 073 355  | SPRING, cprsn .625 OD x 0.93 W                | 1        |
| 5                                |            | 111 998  | PIN, cotter hair .120dia x 2.3                | 1        |
| 6                                |            | 111 929  | HUB, spool                                    | 1        |
| 7                                |            | 147 562  | BAFFLE, center                                | 1        |
| 8                                | FM         | 117 014  | MOTOR, fan 230V 50/60 Hz 2600RPM              | 1        |
| 9                                |            | 005 656  | BLADE, fan 6.000 4wg 30 deg                   | 1        |
| 10                               | CR2        | 108 358  | CONTACTOR, def prp 25A 2P 24V                 | 1        |
| 11                               | SR2        | 180 791  | RECTIFIER, si 1PH 140A 200PIV                 | 1        |
| 12                               |            | 147 461  | PANEL, front                                  | 1        |
| 13                               | R1         | 000 101  | RHEOSTAT, WW 25W 25 ohm                       | 1        |
| 14                               | S2         | 180 777  | SWITCH, rotary 6 pin 1P 600V                  | 1        |
| 15                               | RC3        | 048 282  | RECEPTACLE w/SOCKETS                          | 1        |
| 16                               |            | 147 560  | PANEL, side lower                             | 1        |
| 17                               | T1         | 180 786  | TRANSFORMER, power main                       | 1        |
| 18                               | PC1        | 172 543  | CIRCUIT CARD, (consisting of)                 | 1        |
| 19                               | F1         | 073 426  | FUSE, mintr slo-blo 5A 250V                   | 1        |
| 20                               | CR2        | 080 388  | RELAY, encl 24VAC 3PDT 10A/120VAC             | 1        |
|                                  |            | 173 299  | CLIP, hold-down relay                         | 1        |
| 21                               |            | 110 375  | STAND-OFF, support PC card                    | 4        |
| 22                               |            | 147 563  | WRAPPER                                       | 1        |
| 23                               |            | 089 899  | LATCH, slide flush                            | 1        |
| 24                               |            | 134 327  | LABEL, warning general precautionary          | 1        |
| 25                               |            | 126 415  | CLAMP, saddle                                 | 1        |
| 26                               |            | 126 416  | HANDLE, molded plastic                        | 1        |
| 27                               |            | 111 443  | BUSHING, strain relief                        | 1        |
| 28                               | PLG1       | 152 118  | CORD SET, 250V 6-50P 126A 3/c                 | 1        |
| 29                               |            | 605 227  | NUT, 750-14 knurled                           | 1        |
| 30                               |            | 180 849  | PANEL, rear                                   | 1        |
| 31                               | GS1        | 128 751  | VALVE, 230VAC 2 way                           | 1        |
| 32                               | RC2,3      | 181 649  | RESISTOR, WW fxd 40W 25 ohm                   | 2        |
| 33                               | VR1        | 090 288  | VARISTOR w/TERMINALS                          | 1        |
| 34                               | C1         | 162 245  | CAPACITOR, elctlt 140000uf                    | 1        |
| 35                               |            | 022 160  | CLAMP, capacitor 3.000dia                     | 1        |
| 36                               | Z1         | 180 793  | STABILIZER                                    | 1        |
| 37                               |            | 180 850  | BASE  | 1        |
| 38                               |            | 147 548  | NUT, speed push-on type                       | 12       |
| 39                               |            | 146 753  | BEZEL, front/rear                             | 2        |
| 40                               |            | 010 368  | CLAMP, work 200A                              | 1        |
| 41                               |            | 026 843  | INSULATOR, vinyl blk                          | 2        |
| 42                               |            | 600 325  | CABLE, weld cop strd No. 6                    | 16ft     |
| 43                               |            | 169 903  | M-15 GUN, (Fig 7-2)                           | 1        |
| 44                               |            | 111 644  | BUSHING, strain relief                        | 1        |
| 45                               | S1         | 116 830  | SWITCH, rocker DPST 10A 250VAC                | 1        |
| 46                               |            |          | NAMEPLATE, (order by model and serial number) | 1        |
| 47                               |            |          | KNOB, pointer (included w/Item 14)            | 1        |
| 48                               |            | 097 922  | KNOB, pointer .875dia x .250                  | 1        |
| 49                               | TE1        | 122 385  | TERMINAL ASSEMBLY, (consisting of)            | 1        |
| 50                               |            | 174 504  | LINK, jumper                                  | 2        |
|                                  |            | 113 149  | CONNECTOR, rect 156 14skt                     | 1        |
|                                  |            | 110 160  | CONNECTOR, rect 156 6skt                      | 1        |
|                                  |            | 000 067  | TIP, contact scr .030 wire x 1.125            | 2        |
|                                  |            | 000 068  | TIP, contact scr .035 wire x 1.125            | 3        |
|                                  |            | 087 299  | TIP, contact scr .023 wire x 1.125            | 3        |
|                                  |            | 166 575  | WRENCH, hex .078 across                       | 1        |
|                                  |            | 135 615  | BUSHING, nylon .390 ID x .750 OD x .750 lg    | 2        |

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



\*Includes Item 17

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**Figure 7-2. M-15 Gun**

| Item No.   | Part No.  | Description  | Quantity |
|--|-----------|--|----------|
| <b>169 903      Figure 7-2. M-15 Gun (Fig 7-1 Item 43)</b> |           |  |          |
| ... 1  | 169 715   | .. NOZZLE, slip type .500 orf flush                          | 1        |
| ... 2  | ♦ 087 299 | .. TIP, contact scr .023 wire x 1.125                        | 2        |
| ... 2  | 000 067   | .. TIP, contact scr .030 wire x 1.125                        | 2        |
| ... 2  | ♦ 000 068 | .. TIP, contact scr .035 wire x 1.125                        | 2        |
| ... 3  | 169 716   | .. ADAPTER, contact tip                                      | 1        |
| ... 4  | 170 470   | .. RING, retaining   | 1        |
| ... 5  | 170 471   | .. O-RING  | 1        |
| ... 6  | 169 717   | .. WASHER, shock   | 2        |
| ... 7  | 169 718   | .. TUBE, head  | 1        |
| ... 8  | 169 738   | .. NUT, locking handle                                       | 2        |
| ... 9  | 169 719   | .. NUT, jam (gun end)  | 1        |
| ... 9  | 169 732   | .. NUT, jam  | 1        |
| ... 10   | 169 720   | .. CONNECTOR, cable (gun end)                                | 1        |
| ... 10   | 169 733   | .. CONNECTOR, cable  | 1        |
| ... 11   | 169 721   | .. NUT, connector  | 2        |
| ... 12   | 172 017   | .. M15 UNICABLE CLAMP KIT, (consisting of)                   | 1        |
| ... 13   | 169 735   | .. CLIP, compression   | 2        |
| ... 14   | 169 742   | .. TUBE, support   | 2        |
| ... 15   | 169 743   | .. CLAMP, inner  | 2        |
| ... 16   | 169 740   | .. CLAMP, jacket   | 2        |
| ... 17   | 169 746   | .. CONNECTOR, switch lead                                    | 2        |
| ... 18   | 169 737   | .. HANDLE  | 2        |
| ... 19   | 169 741   | .. STRAIN RELIEF, cable                                      | 2        |
| ... 20   | 180 433   | .. CORD, trigger assembly (consisting of)                    | 1        |
| ... 21   | 180 551   | .. BLOCK, terminal rear inc/dec                              | 1        |
| ... 22   | 180 427   | .. CORD, trigger   | 1        |
| ... 23   | 173 521   | .. CONNECTOR, feeder (consisting of)                         | 1        |
| ... 24   | 079 974   | .. O-RING, .500 ID x .103CS rbr                              | 2        |
| ... 25   | ♦ 172 257 | .. KIT, liner monocoil .023/.025 wire x 15ft (consisting of) | 1        |
| ... 25   | 172 258   | .. KIT, liner monocoil .030/.035 wire x 15ft (consisting of) | 1        |
| ... 26   | 079 975   | .. O-RING, .187 ID x .103CS rbr                              | 1        |
| ... 27   | 169 723   | .. GUIDE, outlet   | 1        |
| ... 28   | 169 739   | .. SWITCH, trigger   | 1        |

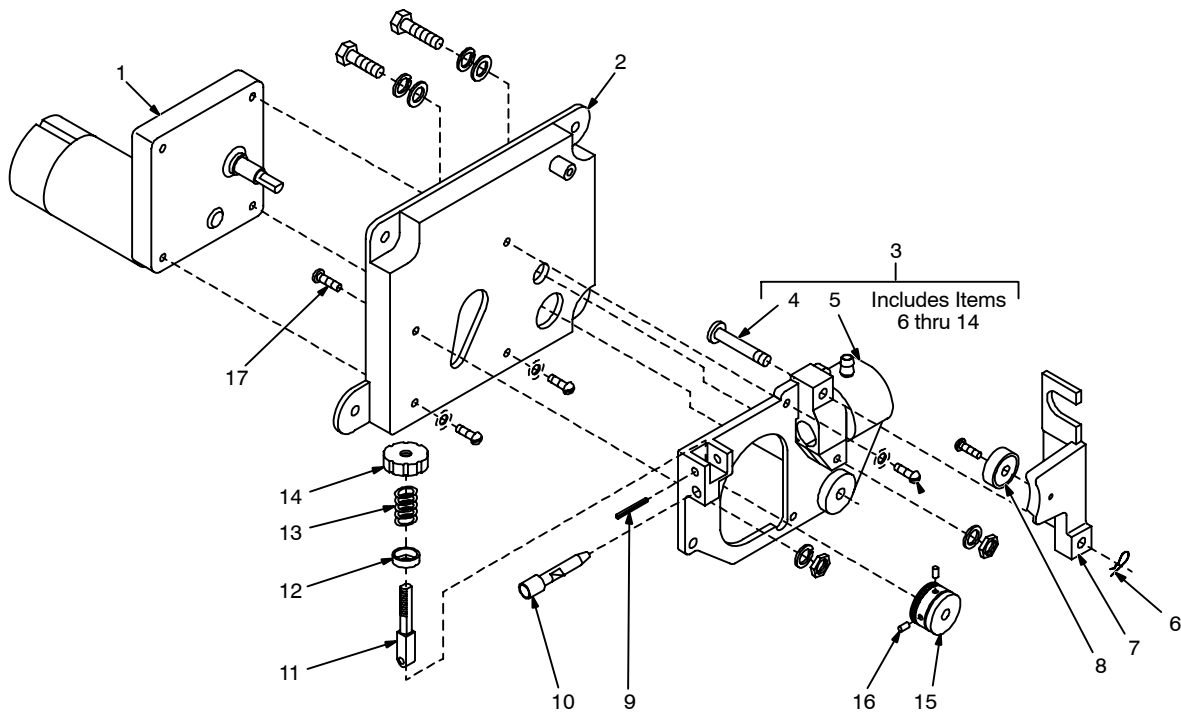
♦ OPTIONAL

BE SURE TO PROVIDE MODEL AND STYLE NUMBER WHEN ORDERING REPLACEMENT PARTS.

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|----------|------------|----------|-------------|----------|
|----------|------------|----------|-------------|----------|

**Figure 7-3. Drive Assembly, Wire (Fig 7-1 Item 1)**

|     |    |     |         |  |   |
|-----|----|-----|---------|--|---|
| ... | 1  | MOT | 173 446 | MOTOR, 12VDC   | 1 |
| ... | 2  |     | 129 893 | INSULATOR, housing drive   | 1 |
| ... | 3  |     | 126 838 | DRIVE ASSEMBLY, wire (consisting of)                                       | 1 |
| ... | 4  |     | 090 416 | PIN, hinge   | 1 |
| ... | 5  |     | 124 817 | HOUSING, wire drive  | 1 |
| ... | 6  |     | 151 828 | PIN, cotter hair .054 x .750   | 1 |
| ... | 7  |     | 112 031 | LEVER, pressure roll   | 1 |
| ... | 8  |     | 090 443 | BEARING, ball rdl sgl row .866 OD x .447 width x .315 bore (consisting of) | 1 |
| ... |    |     | 111 622 | SPACER, bearing .196 ID x .310 OD x .500 collar                            | 1 |
| ... | 9  |     | 010 224 | PIN, spring CS .187 x 1.000  | 1 |
| ... | 10 |     | 058 549 | GUIDE, wire inlet 1/16   | 1 |
| ... | 11 |     | 085 242 | FASTENER, pinned   | 1 |
| ... | 12 |     | 085 244 | WASHER, cupped stl .328 ID x .812 OD x .125                                | 1 |
| ... | 13 |     | 090 415 | SPRING, cprsn .720 OD x .070 wire x 1.250                                  | 1 |
| ... | 14 |     | 092 237 | KNOB, adj tension  | 1 |
| ... | 15 |     | 119 028 | ROLL, drive V groove combination   | 1 |
| ... | 16 |     | 602 169 | SCREW, set stl sch 8-32 x .187 cup point                                   | 2 |
| ... | 17 |     | 114 415 | SCREW, mach stl phflh 10-24 x .625   | 1 |
| ... |    |     | 166 575 | WRENCH, hex .078   | 1 |



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**Figure 7-3. Drive Assembly, Wire**

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.